

Report of a Case Of Rat-Bite Fever Due to *S. moniliformis*

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REPORTS of only 51 bacteriologically proved cases of rat-bite fever caused by *Streptobacillus moniliformis* can be found in the United States through 1951.

Yet with our ever-present rat population, this disease must be considered in the differential diagnosis of obscure febrile illnesses as well as in illnesses following a rat bite. A history of the actual rat bite cannot always be obtained. The disease may be transmitted by any rodent and also by dogs and cats. Laboratory rats, as well as wild rodents, may harbor the organism. Most of the cases have occurred in children or in men whose occupations take them into rat-infested areas. There is also the possibility of the disease being spread by food, as in the 1926 milkborne epidemic in Haverhill, Mass. This epidemic was called Haverhill fever (epidemic arthritic erythema).

The case of rat-bite fever reported here occurred in 1952 in an 8-year-old Seattle boy who was bitten on the tongue by his pet white rat. The disease has previously been reported as being acquired from white rats by laboratory workers. It is the first known case reported from the State of Washington.

It is generally considered that rat-bite fever can be caused by two distinct organisms: *Streptobacillus moniliformis*, a normal inhabitant of the nasopharynx of rats, and the spirochete, *Spirillum minus* (the disease having been originally described in Japan and called sodoku) which is present in infected eyes of rats. Both organisms may be present in the same case.

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Occurrence of the Disease

Watkins (1) in a complete review of the disease in 1946 found a total of 184 cases of rat-bite fever reported in the United States. Of these, 39 cases were proved to be caused by *S. moniliformis* and 41 cases, by *S. minus*. Since 1946 two cases due to *S. moniliformis* have been reported from Massachusetts and one each from Connecticut, California, Delaware, Illinois, Maryland, Michigan, Minnesota, New York, Texas, and Wisconsin.

Until 1951 no proved cases caused by *S. moniliformis* had been reported in the United States west of Minnesota and Missouri, and no clinically diagnosed case had been reported in Canada west of Montreal. In that year, one case was reported from Los Angeles and two cases from Vancouver, British Columbia (2).

This geographic distribution is, no doubt, a matter of recognition and reporting, since there is no reason to believe this worldwide disease is new to western North America. Cases of rat-bite fever caused by *S. minus* have been reported from California and Oregon.

In describing the disease, it is desirable to specify the organism involved and whether it was caused by a rat bite or by some other means of entry into the body.

Diagnosis and Treatment

Clinically, rat-bite fever due to *S. moniliformis* is characterized by septic or relapsing fever and frequently by petechial or morbilliform rash and polyarthritis. The incubation period varies from 1 to 22 days, usually less than 10 days. The primary wound generally heals rapidly. There may be regional lymphadenopathy. Leukocytosis is usually present. About 16 percent of the cases have a false positive serologic test for syphilis. The diagnosis is confirmed by culture on special media and by animal or chick embryo inoculation of blood, joint fluid, or abscess material. Specific agglutination tests may be obtained in a few laboratories where the antigen is available. The titer usually reaches a peak between 1 and 3 months and may persist for 2 years. Specific skin tests may be positive for 4 to 5 months after the infection. Six deaths have

been reported due to this organism in the United States. The most significant findings at autopsy have been myocarditis, endocarditis, and pneumonia.

The disease caused by *S. minus* is remarkably similar clinically to that caused by *S. moniliformis*. The fever is more likely to be relapsing. The local ulcer tends to be more indurated. Arthritis is less common. Approximately 51 percent have false positive serologic tests for syphilis. *S. minus* may be recognized by darkfield examination or by animal inoculation.

Either penicillin or streptomycin is usually effective in the treatment of rat-bite fever caused by either of the organisms. However, one case due to *S. moniliformis* has been reported which responded to streptomycin after failing to respond to penicillin, and another case caused by the same organism was reported which was refractory to both of these antibiotics. It is advisable to perform antibiotic sensitivity tests on the organisms.

CASE REPORT

K. S., an 8-year-old white boy, was admitted to the United States Public Health Service Hospital, Seattle, April 28, 1952, with chills, fever, headache, and vomiting of 6 hours' duration. Four days prior to admission, the child had been bitten on the tongue by his pet white rat. Other members of the family were in good health.

On physical examination his temperature was 103° F., his pulse was 96 per minute, respirations were 22 per minute, and blood pressure was 110 mm. Hg systolic and 70 mm. Hg diastolic. He did not appear to be in acute distress. There were small petechiae around the mouth. There was a small ulcer on the left side of the tip of the tongue with a small area of induration around the ulcer and on the inferior surface of the tongue. The pharynx was moderately injected. Rhonchi were present in the right lower chest. A systolic apical murmur was heard on expiration only. The murmur had the quality of a functional murmur. Physical examination was otherwise normal.

The roentgenogram of the chest at admission was negative. The day following admission the leukocyte count was 17,000 per cu. mm. with

72 percent neutrophils, 25 percent lymphocytes, 2 percent monocytes, and 1 percent basophils. The erythrocyte count was 5,400,000 per cu. mm. The hemoglobin was 14 gm. The platelet count was 83,000 per cu. mm. The hematocrit was 38 percent. The erythrocyte sedimentation rate and the urinalysis were normal. The standard Kahn test was negative. A blood culture was taken on April 29 and a sample was sent to the Seattle-King County Department of Health Laboratory, together with the history of the rat bite. This laboratory recovered the *Streptobacillus moniliformis* by culture on standard tryptose phosphate broth enriched with 20 percent ascitic fluid. After 5 days of incubation the typical fluffy ball colonies were present in the broth, and smears showed the characteristic pleomorphic organisms with filaments and beads. The organism was inoculated into four mice, all of which died, and the same organisms were recovered from them. The laboratory has been able to maintain the strain on Löffler's medium until this date. No pleuropneumonia-like (L_1) organisms were seen.

On April 29 the child was started on 300,000 units of procaine penicillin intramuscularly daily for 4 days. The temperature, which ranged between 102° and 104° F. on the first day, dropped to 101° F. on April 29. The following day the temperature was normal and remained so. After the first day the child slept well and had no complaints. The petechial rash around the mouth faded and the ulcer on the tongue began to heal rapidly.

The child was discharged from the hospital May 2, 1952. Since then he has been well. It was ascertained that the rat had been obtained from a pet shop in Seattle. The family gave the rat responsible for the illness to the Seattle-King County Laboratory where it was autopsied, but no organisms were obtained from the examinations.

REFERENCES

- (1) Watkins, C. G.: Ratbite fever. *J. Pediat.* 28: 429 (1946).
- (2) Dolman, C. E., Kerr, D. E., Chang, H., and Shearer, A. R.: Two cases of rat-bite fever due to *Streptobacillus moniliformis*. *Canad. J. Pub. Health* 42:228 (1951).